THE IMPACT OF PRODUCT HEALTH DESCRIPTION AND SERVING SIZE INFORMATION ON CONSUMPTION

by

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Abstract

The main goal of this study was to investigate the effects of manipulating product health descriptions and serving size information on actual calorie consumption and estimations of calorie consumption. In a 3 (no description vs. healthy description vs. unhealthy description) by 2 (normal serving size information vs. larger serving size information) factorial design, 150 females over the age of 18 years were invited to partake in a "taste test" of an oatmeal cookie product. In terms of consumption, it was found that participants who received the larger serving size information (labelled as 4 cookies/280 calories), which was double that of the normal serving size information presented on traditional packaging (labelled as 2 cookies/140 calories), consumed significantly less (M=139.92 calories, SD=98.88) than those who received the normal serving size information (M=197.98 calories, SD=145.96). Participants therefore consumed approximately 29% less when they were presented the larger serving size information compared to the normal serving size information. When looking at overall accuracy of calorie estimations or how close their estimation was to their actual consumption, it was found that those who received the larger serving size information were significantly more accurate at estimating their actual calorie consumption (M=57.42 calories, SD=73.97) than those who received the normal serving size information (M=94.70 calories, SD=109.68). Furthermore, participants presented with a healthy product description were significantly more likely to underestimate the amount of calories they consumed during the experiment (M=-52.70 calories, SD=92.25) than those who received no product description (M=-6.72 calories, SD=132.81) or an unhealthy product description (M=7.89 calories, SD=127.14). Thus, product descriptions as well as serving size information can have a significant impact on calorie consumption and an individual's estimation of their perceived calorie intake.

Keywords: health expectations, product descriptions, nutrition facts, serving size, calorie consumption, calorie estimation

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Chapter One: Introduction

The choices that people make regarding what they eat and how much they eat are fueled by learned attitudes that certain foods are inherently healthy or unhealthy. Research has shown that package labelling, as well as marketing can impact health expectations and consumption levels. For example, studies have shown that consumption increases when a food is presented with a description that focuses on the health benefits of the product and ignores any mention of ingredients that are associated with weight gain (Provencher, Polivy, & Herman, 2009). Furthermore, foods that are marketed using branding that focuses on the healthiness of the company's products are often perceived as containing fewer calories (Chandon, 2012; Oakes, 2005). Research has shown that meals with the same calorie content from Subway are often wrongfully assumed to have significantly less calories than meals from McDonalds because Subway is marketed as a healthy alternative to typical fast food restaurants (Wansink & Chandon, 2007). Thus, labelling and marketing can have a major impact on health expectations, which influences consumption.

In the United States, the Food and Drug Administration (FDA) provides detailed guidelines that allow manufacturers to set portion sizes that reflect what the average person over four years old would consume in a single sitting. The data is based on surveys conducted between 1977-1978 and 1987-1988 (Young, 2014). In Canada, food labelling regulations are controlled by Health Canada and the Canadian Food Inspection Agency (CFIA). Health Canada creates policies pertaining to the health and safety of foods and the CFIA enforces these policies, as well as other non-health related policies pertaining to food labels. The reference amounts set in Schedule M of the Food and Drug Regulations (FDR) by Health Canada are comparable to

those outlined by the FDA (Government of Canada, 2016). It has been proposed in the literature that current serving sizes on packaging are outdated and modification is required in order to represent what the average person consumes in present day, as serving sizes have significantly increased over the years (Environmental Working Group, 2014). This is an important area of research, as it poses the question of whether increasing current serving size information to be more representative of actual serving sizes would increase consumption awareness. If consumers could more easily calculate their calorie intake based on the values provided on the nutrition facts table this would allow more informed choices regarding the products that they buy and how much they consume.

In 2014, the CFIA reached out to consumers to determine ways that would improve food labelling. Canadian citizens expressed a need for changes to the nutrition facts table concerning the percent daily values, nutrients, sugars, ingredient list, and serving size information (Government of Canada, 2014). Based on the results of this study, Health Canada proposed a number of changes to the labelling on food packaging that may be implemented in the near future. For the purpose of the current study, a focus was placed on the changes relating to serving size information. In terms of serving size, it was proposed that the nutrition facts table be more consistent across different brands of the same food product making it easier to compare products. For example, listing the serving size in number of pieces, a fraction or in cups rather than only in grams or millilitres would assist consumers in estimating their consumption as these measurements are more easily calculated. The potential changes also focused on making the serving size on packaging reflect the amount typically eaten, such as having bread labels read two slices per serving rather than only one slice. The current study examined the implications of these changes. Theoretically, modifying current serving sizes on product packaging helps to not

only compare similar foods, but to also make informed choices. Thus, the current study analyzed whether these changes would actually impact consumption and perceived calorie intake.

Overall, research has shown that consumers tend to be inaccurate when it comes to estimating their daily caloric intake. A study by the United States Department of Agriculture (2000) found that people's perception of their caloric intake is very different than their actual intake. The study showed that while adults tend to significantly underestimate their consumption of grains, fats, oils and sweets, they tend to overestimate their consumption of fruit, dairy products, meat, poultry, fish, beans, eggs, and nuts. Among the 5,752 adults included in the study, it was found that on average people underestimate their true daily caloric intake by 30%. The range of accuracy was between 10% to 45%, and highly dependent on factors such as, age, sex, education level, and socioeconomic status. More specifically, it was found that the underreporting of caloric intake increases with age, is greater among women, people who are overweight, have lower levels of education, and lower income status. The current study examined whether modifying product health descriptions or serving size information could increase calorie content awareness and lead to more accurate estimations of intake.

Thus, the current study sought to determine whether health descriptions and serving size information would have an impact on food consumption and caloric intake estimations. This study demonstrated the impact of health descriptions, and determined if modifying serving size information to be more representative of what people actually consume would increase or decrease consumption. In this study, the same product was presented with varying health descriptions (no description, healthy description, unhealthy description), as well as varying serving size information (normal serving size, larger serving size). Actual consumption, estimations of calorie consumption, as well as product evaluations were collected with the goal

of determining whether consumption and health perceptions could be altered based on the information provided on labelling.

1 Product Health Descriptions

Labelling and marketing strategies can potentially mislead consumers to believe certain foods are healthy or unhealthy, which may influence consumption. For example, Provencher, Polivy, and Herman (2009) conducted a study to determine whether food product descriptions can influence the amount that people consume. The researchers presented half the participants with oatmeal cookies described as "healthy" and the other half with the same oatmeal cookies, but described as "unhealthy". In the "healthy" condition, the cookies were described as being high in fibre, low in saturated fat, free from trans-fat, and made with healthy ingredients. In comparison, the cookies in the "unhealthy" condition were described as gourmet, made with fresh butter and old-fashioned brown sugar with a pleasant sweet taste. Despite the fact that both cookies were the same, participants in the "healthy" condition consumed an average of 35% more calories. Moreover, the cookies were reported to be healthier, less likely to promote weight gain, and appropriate for a healthy menu. This study demonstrates that health descriptions can dramatically change a person's opinion of a product, which also influences their food intake. In addition to verifying these results, the current study sought to take these findings a step further to explore how serving size information can also influence consumption in order to determine what element of packaging has a greater impact on health perceptions and consumption awareness.

It has been shown in numerous studies that consumers rely on health claims located on the front of packaging when making purchasing decisions rather than actual nutritional values located in the nutrition facts table (Dudhate, 2017; Miller & Cassady, 2015; Wansink & Chandon, 2006). This is an issue because front label health claims can often be considered

misleading. For example, the front label of a product may read “fat-free” and the product can still contain up to 0.5 grams of fat per serving (EatRight Ontario, 2016). McCullum and Archterberg (1997) explored how labels can influence food purchasing decisions for high school adolescents. They instructed participants to enter a grocery store and purchase 20 items that were provided on a list (ex. milk, peanut butter, hot dogs). After purchasing these products, the participants were questioned about what factors fueled their decision to choose particular brands. It was found that participants were five times more likely to use the front label claims (ex. low fat, light, cholesterol free) than actual nutrition facts when making their purchasing decisions. After personal preference/taste (M=10.82/20 items), health reasons (M=5.40/20 items) were classified as the most common factor reported to influence food item selection. Furthermore, it was found that females relied on labels more often than males. This suggests that females may be more concerned about controlling their weight, as multiple studies have shown women tend to be more preoccupied with dieting than males (Hayes, D’Anci, & Kanarek, 2011; Krones, 2009; Polivy & Herman, 2004). This is likely due to the fact that the ideal body image for women is extremely thin, as portrayed in present day media (Hayes, D’Anci, & Kanarek, 2011). The current study took these findings into consideration in the decision to only use female participants, as the expected results were anticipated to be more pronounced for this gender.

People often use heuristics to assess foods, which can lead to the assumption that certain labels or ingredients indicate the healthiness of a product. This can be considered a form of top-down processing in that the consumer bases their purchasing and eating decisions on a single health claim, rather than detailed nutrient information (Park, Iyer & Smith, 1989). For example, consumers assume that “fruits” and “vegetables” are healthy and therefore utilizing these words on packaging can send the message that the product promotes health. Sütherlin and Siegrist

(2015) conducted a study to determine whether adding the label "fruit sugar" instead of "sugar" would change perceptions of a cereal product's healthiness even though no fruit was actually in the product. Participants were instructed to indicate the products healthiness using a scale (0 meaning "not at all healthy" and 100 meaning "very healthy"). It was found that participants in the "fruit sugar" condition rated the product as significantly healthier (M=48.71) than in the "sugar" condition (M=40.16). This study demonstrates the magnitude of effect subtle word changes on product packaging can have on product health perceptions.

Research has also shown that the addition of a "phantom ingredient" can change a person's sensory evaluations and influence purchasing decisions. For example, Wansink (2006) found that when a nutrition bar was labelled as containing soy, even though no soy was actually present in the product, participants provided significantly less favourable evaluations of taste, aftertaste, and likelihood of purchasing the product in the future. This study shows that changing wording on packaging even slightly can have a significant impact on health expectations and product evaluations. The goal of the current study was to alter entire product descriptions to further explore how labelling strategies can influence health expectations. As previous studies have found that subtle changes to the wording regarding health components of food products can influence health perceptions and thus modifying entire product descriptions should only magnify this effect further.

Food marketing can also have a major impact on health perceptions. For example, research has shown advertising a food as "organic" can drastically influence product evaluations. Organic foods are defined as any product grown without pesticides, fertilizers made with synthetic ingredients, bioengineering, or ionizing radiation (Lee, Shimizu, Kniffin, & Wansink, 2013). The media has made it known that there are concerns with consuming products grown

using non-organic methods (i.e. with pesticides). Therefore, consumers have let this motivate their purchasing decisions by leading them to choose organic foods. However, more and more research is showing that consuming genetically modified fruits and vegetables is not less healthy than consuming those grown organically (Key, Ma, & Drake, 2008). In fact, Health Canada has not found any published scientific evidence suggesting that genetically modified organisms (GMOs) approved for sale in Canada are any less safe or nutritious than food grown using conventional "organic" methods, such as crop rotation, biological pest control and compost (Government of Canada, 2009). Despite this fact, consumers often view foods labelled as "organic" as being healthier and containing fewer calories (Schuldt & Schwarz, 2010).

Lee, Shimizu, Kniffin, and Wansink (2013) completed a study with the goal of determining how organic labels can influence perceived caloric content, willingness-to-pay, and nutritional evaluations. Participants were presented with three paired food samples—cookies, chips, and yogurt (one labelled organic and one not) and given a variety of questionnaires. It was found that foods labelled as organic were perceived to be significantly lower in calories than those not labelled as organic (cookies M=144.93 vs. M=191.07, chips M=153.18 vs. M=199.08, yogurt M=90.39 vs. M=113.13). Participants also expressed that they would be willing to pay significantly more for the products labelled organic than those not labelled as organic (cookies M=$1.95 vs. M=$1.68, chips M=$1.74 vs. M=$1.68, yogurt M=$1.40 vs. M=$1.17). This study demonstrates that organic labels can be misconstrued as meaning the product is healthier than other non-organic products. However, this is not necessarily true. In the current study, both the "healthy" and "unhealthy" product descriptions can be considered accurate, as they focus on either all the ingredients that benefit health or all the ingredients that are associated with weight

gain. Therefore, the descriptions each send drastically different messages about the product's healthiness, which can impact consumer health expectations.

Along with influencing product evaluations, low fat nutrition labels can also increase food intake by sending the message that the serving size should increase if the food is healthy. Wansink and Chandon (2006) conducted an experiment to explore whether the addition of low fat labels would increase consumption. Participants were assigned to one of two rooms. In each room there were two bowls, one with 10 ounces of M&Ms (1380 calories) and the other 10 ounces of granola (1330 calories). Participants in the first room had their bowls labelled as "regular fat" and participants in the second room had their bowls labelled as "low fat". Participants were given questionnaires asking them to estimate the number of ounces and calories that would be appropriate for a typical person to consume during a 90-minute movie. The results showed that participants in the "low fat" condition rated the appropriate serving size as 25.1% larger than those in the "regular fat" condition. This study demonstrates that labels can significantly impact consumption. In the current study, the health descriptions are composed of entire sentences that exaggerate the "healthy" or "unhealthy" aspects of the product, which was expected to significantly alter health perceptions and influence consumption.

2 Serving Size Information on Packaging

There are many factors that can affect how much a person chooses to consume in a single sitting. As previously mentioned, whether a product is advertised as "healthy" or "unhealthy" can guide consumption choices, as well as front label claims. Another important factor to take into consideration is whether consumers are paying attention to the nutrition facts on the products they consume and basing their consumption on this information. Current health product packaging standards in Canada and the United States, require packaged foods to have an

"amount per serving" in the nutrition facts table, which dictates the listed amounts and % daily value of the 13 core nutrients (total fat, saturated fat and trans fats, cholesterol, sodium, carbohydrates, fibre, sugars, protein, Vitamin A, Vitamin C, calcium, and iron). Although the "amount per serving" is often referred to as a "suggested serving size", Government of Canada (2018) reports that this serving size is not necessarily the suggested quantity of food you should eat, but rather a quantity that can be used to calculate how much you are eating and compare similar foods. Nevertheless, if these values are supposed to inform choices and lead to higher consumption awareness, they should be a realistic representation of an amount typically consumed. Two opposing theories exist as to the effect of increasing serving size information on consumption, which will be discussed in the following sections.

In the current study, "serving size information" is considered the "amount per serving" located on a product's nutrition facts label. As previously mentioned, in the United States, these portion sizes are determined by the FDA and indicate the typical amount a person over the age of four would consume in one sitting. The data that was used to create the standards to determine serving sizes on packaging is presented in a document called the Reference Amounts Customarily Consumed (RACCs). Research has shown that the values presented in the RACCs are no longer representative of what people would normally consume in present day, as packaging sizes and in turn portion sizes have increased (FDA, 2016). Young and Nestle (2002) reported that portion sizes and average body weight have been sharply increasing in parallel since the 1980s. In one particular study, they showed that marketplace serving sizes were extremely larger than typical labelling standards. They discovered that the largest discrepancy was found in the cookie category with average samples being 700% over the typical standards. An indirect demonstration of how public perceptions of serving size have changed over the years

was shown when Wansink and Wansink (2010) analyzed 52 paintings of the Last Supper and found that over time the serving sizes displayed have increased significantly—the size of the main course depicted has increased 69.2% from 1945 when it was created to present day. Another demonstration of this trend was found when Young and Nestle (2002) analyzed cookbooks published over the past 40 years. They found that newer editions labelled the recipes with the same quantity of ingredients as having fewer servings. In other words, the amount of food in each serving increased in the newer cookbook editions. It has been shown in numerous studies that it is not uncommon for a person to consume more than double of what is presented on the nutrition facts table as a serving size even when they are serving themselves (Benton, 2015; Bryant & Dunes, 2005). Therefore, it can be difficult for people to accurately calculate the calories and nutrient content for the amount they are actually consuming. Furthermore, it is impossible for the data collected to be representative of the entire population of individuals over the age of 4 years, as caloric intake varies between children and grown adults, as well as between males and females. All of the findings discussed demonstrate two things: the perception of how large a serving size is has increased over time and many of the current serving sizes on labels underestimate the amount people are eating in a single serving.

3 Factors that Affect Serving Size

As discussed, nutrition labels provide serving size information that contains an "amount per serving", which is one factor that can influence how much a person chooses to consume. However, other factors involving changes to the eating environment can also have a significant impact on consumption behaviours. Factors such as, the size of packaging and serving utensils, as well as the colour contrast between the food and the dinnerware can influence serving size (van Ittersum & Wansink, 2012; Wansink, van Ittersum, & Painter, 2006). Branding and

marketing tactics can also influence what product a person chooses to purchase, and in turn, their consumption patterns. For example, studies have shown that single nutrition claims located on the front of packaging (ex. fat free) can influence health perceptions, and subsequently impact purchasing decisions and consumption (Wansink & Chandon, 2007). It is important to take these factors into consideration when conducting studies on consumption because doing so helps to ensure that the proper controls are in place to limit the effects of these variables in order to examine only the effects of the intended manipulations.

Firstly, research has demonstrated that subtle changes to the eating environment are one of the many factors that can drastically impact consumption. Studies have shown that people consume significantly more when using large dinnerware (Wansink, van Ittersum, & Painter, 2006). This is due to the Delboeuf illusion (Van Ittersum & Wansink, 2012), which occurs when two identical circles are presented next to each other, one with a much larger circle surrounding it and the other a slightly larger circle surrounding it. When asked, people express that the circle surrounded by a slightly larger circle looks significantly larger than the circle surrounded by a much larger circle. This optical illusion of relative size leads people to perceive the same serving size on a smaller plate as significantly larger. Wansink, van Ittersum, and Painter (2006) conducted a study to test whether dinnerware size would impact serving size. Participants were presented with either a 17 or 34-ounce bowl and asked to serve themselves ice cream. It was found that those with the larger bowls served themselves 31% more—127 calories of ice cream (Wansink, van Ittersum, & Painter, 2006). Another study presented participants with a hamburger on either a small plate or a larger plate and asked them to estimate the number of calories in that serving. It was found that people estimated the hamburger to have 18% more

calories if it was presented on a small plate. The same results have been replicated many times for a variety of foods (Wansink, 2010).

Furthermore, van Ittersum and Wansink (2012) conducted studies on how colour contrast between the plate and the food can impact consumption. Participants were presented with either a red or white plate and served pasta with either Alfredo or tomato sauce and their consumption was measured. It was found that the participants who had low contrast between their food and the plate it was served on consumed significantly more than those with high contrast. For example, those with Alfredo sauce on a white plate consumed 30% more pasta than those served Alfredo sauce on a red plate. The results of these studies were taken into account when designing the current study, as it demonstrates the importance of presenting each participant with the same serving size on the same plate. If serving or plate sizes were altered between participants it may be the environmental/visual changes that impact consumption differences rather than the intended manipulations.

Another phenomenon that can influence serving size has been coined the "health halo" effect. The "health halo" effect refers to the act of overestimating the healthfulness of a product based on a single nutrition claim (ex. low in fat) and assuming that if the food is healthy that consumption should increase. Therefore, perceived healthiness and consumption can also be influenced by the way brands are marketed. Research has shown that consumers are more likely to underestimate main dish calorie content, and in turn, choose side dishes that are high in caloric content while dining at restaurants that claim to be healthy—this can be considered an example of the "health halo" effect in action. Wansink and Chandon (2007) have conducted multiple studies to explore how marketing can influence consumer's perceptions of calorie content in restaurant meals. In one study, participants were asked to estimate the amount of calories in a

meal from Subway, as well as a meal from McDonald's. Subway is advertised as a healthier alternative to McDonald's and the goal of this study was to determine whether this message would impact how people perceive and feel about the food they consume from these restaurants. The results of the study showed that participants estimated that the Subway meal contained 21.3% fewer calories than the McDonald's meal, despite the fact that both meals contained 1000 calories.

A second study found that people who chose a 600 calorie meal from McDonald's were significantly more likely to order a diet drink, as well as less likely to upgrade drink size and order cookies in comparison to people who chose a 900 calorie meal from Subway. These findings demonstrate that caloric misconceptions can influence meal and side dish choice, and can lead a person to consume significantly more calories than which they are aware. In another study, Wansink and Chandon (2007) also found that when participants were presented with a "healthy" menu they would estimate the calories of a meal as significantly lower than when the same meal was presented in an "unhealthy" menu even when the restaurant names were fictitious. This study and others previously discussed demonstrate that it is important for consumers to evaluate the validity of health claims and raise questions regarding the calorie content of main dishes and side dishes in restaurants in order to monitor their own intake and have a realistic representation of their own calorie consumption. In addition, it is necessary for people to learn the importance of critically analyzing the quality and quantity of ingredients. In the current study, participants were presented with a product that was not identified by a specific label or brand to ensure preconceived notions did not impact consumption or product evaluations, which will be discussed further in the methods section.

There are multiple other examples of the "health halo" effect being used in branding, marketing, and labelling. For example, an ice cream brand that launched in Canada in March of 2018, ironically called Halo Top, uses the "health halo" effect in every aspect of their branding. Their products are marketed as being a healthy alternative to traditional ice cream choices, as they claim their products are low in calories, low in fat, and high in protein (Helm, 2018). In fact, on the front of their packaging they boldly display the calories per 125 ml—approximately half a cup (ranging from 80 to 100 calories). Despite the fact that the containers are pint sized—approximately 2 cups (ranging from 320 to 400 calories), the company proudly proclaims on their website and on packaging motivational messages like "Save the bowl—you're going to want the whole pint", "Stop when you hit the bottom", and "Keep digging" (Wray, 2018). All of these messages suggest that the entire pint is a single serving. Messages like the ones used by Halo Top, are becoming a prominent marketing strategy that promote a disregard for internal satiety cues and promote indulging "guilt-free" on "healthy" dessert alternatives that are often unsatisfying. It has been found that people tend to perceive low calorie foods as good and high calorie foods as bad, even if the low calorie foods are desserts (Wray, 2018). Rather than having consumers focus on monitoring food choice and controlling serving size, these "healthy" alternatives are actually promoting overeating. These marketing strategies are teaching consumers to feel guilty about consuming high calorie foods instead of promoting moderation and health awareness (Wray, 2018).

The research findings discussed above demonstrate that consumers often make food choices based on labelling and marketing rather than actual nutritional values. Studies show that current serving sizes are outdated and that consumers are making their meal choices based on environmental cues and/or health claims rather than true information. People are often

consuming more calories than they are aware of, which can be detrimental to their overall health and wellbeing. These studies stress the importance for people to analyze the nutritional values of the products they are consuming to ensure they are aware of their caloric intake. The current study sought to explore whether adjusting these values to be more representative of what people actually consume would impact consumption levels.

4 The Effect of Increasing Serving Size Information on Consumption

A controversy exists as to whether increasing serving size information to be more representative of what people actually consume will increase or decrease consumption. The current study tests against two opposing theories, one stating that increasing serving size information will increase consumption, and the other stating that increasing serving size will decrease consumption. The first is the Consumption Norm Theory, which states that intake is monitored by environmental cues rather than internal cues of satiety (Wansink, Painter, & North, 2005). According to this theory, when people are given information that the serving size is larger, it should increase consumption even though the nutritional value does not change, as it acts as a cue to show what is appropriate, typical, reasonable, and normal to consume. Spanos, Kenda, and Vartanian (2014) invited participants to taste test a pizza labelled as either containing "2 servings" or containing "4 servings". It was found that participants in the "2 servings" condition consumed 27% more than participants in the "4 servings" condition. A potential explanation for this phenomenon is that participants likely viewed the serving size as a norm of how much they should be eating. Although the amount of food did not change, those who received the pizza labelled as containing "2 servings" believed that they should be consuming more as this would mean a typical serving is double the size compared to those who received the pizza labelled as containing "4 servings". These findings support the Consumption Norm

Theory, suggesting that increasing serving size information will lead to higher consumption. This study demonstrates that when calorie content is not displayed, decreasing the labeled number of servings for the same amount of food (in other words, increasing the serving size) can lead to an increase in consumption.

Another possible outcome of increasing serving size may actually be a decrease in consumption because when nutritional content is displayed (ex. calories), the product's unhealthiness becomes more exaggerated. The second theory is the Cognitive Distortion Theory, which states that exaggerating the negative aspects of a product can change thoughts and perceptions (Mohr, Lichtenstein & Janiszewski, 2012). More specifically, increasing the serving size information also increases the calories, which creates the assumption that the product is unhealthy. Research has shown that increasing serving size information and adjusting nutritional values to represent the new serving size has an impact on how consumers view the product. Garretson & Burton (2000) found that people have greater focus on unhealthy nutrients (number of calories, grams of fat, grams of sugar) compared to healthy nutrients (grams of fiber, grams of protein, vitamin percentages). More specifically, they found that increasing the amount of "unhealthy" nutrients impacted consumer perceptions by causing the food to be viewed as less healthy, whereas increasing "healthy" nutrients had no impact on the perceived healthiness of the product.

According to the Cognitive Distortion Theory, a larger serving size should decrease consumption, as it leads people to assume the higher calorie value means the product is unhealthy even though the nutritional value does not change. Hydock, Wilson and Easwar (2016) found that increasing serving size information and therefore increasing calories, as well as nutritional values can impact consumption levels. In this study, serving size (number of servings)

was kept constant, but rather the labelled calorie content was manipulated. It was found that participants rated products with larger serving size information and adjusted nutrition values as being less healthy than those who rated the same product with typical serving size information (200 vs. 400 calories). Participants also expressed that the larger serving size information was more representative of average portion size than what is typically presented. An additional study by the same researchers was performed to determine how serving size information can impact actual consumption by asking participants to eat M&Ms either with a normal or larger serving size label with adjusted calories and nutritional values. It was found that participants who received the packaging with larger serving size information consumed significantly less calories. This study supports the Cognitive Distortion Theory, suggesting that increasing serving size information can actually decrease consumption.

5 Overview of the Current Study

The current study explored how product health descriptions and serving size information could impact actual consumption and estimations of calorie consumption. Previous research has shown that using product descriptions that focus on the health benefits of the product instead of contents that are associated with weight gain can influence health expectations and lead to higher levels of consumption (Oakes, 2005; Provencher, Polivy, & Herman, 2009**)**.

The current study sought to determine the impact of varying serving size information on consumption by exploring which of the two theories presented above would be supported. Research on altering serving size information has shown conflicting results. Some studies have shown that increasing serving size information will increase consumption, supporting the Consumption Norm Theory (Wansink, van Ittersum, & Painter, 2006). Other studies have shown that increasing serving size information will decrease consumption, supporting the Cognitive

Distortion Theory (Hydock, Wilson, & Easwar 2016). The aim of the current study was to determine which of these theories would be supported.

This line of research is of the upmost importance because rates of obesity are rising rapidly (Nuttall, 2015). Statistics show that one in four adult Canadians, or about 6.3 million people were classified as "obese" in 2011 to 2012. Moreover, the proportion of Canadians who were obese had increased 17.5% since 2003 (Navaneelan & Janz, 2012). It is known that obesity increases a person's risk of heart disease, stroke, high blood pressure, diabetes, and other chronic diseases (Fontaine & Barofsky, 2001). It is also the number one cause of preventable death accounting for approximately 9.3% of deaths in Canada (Government of Canada, 2011). Furthermore, the economic burden of obesity-related health costs in Canada amounts to anywhere from $4.6 to $7.2 billion annually. Thus, analyzing methods to overcome obesity are crucial. If modifying serving size information does influence consumption, then the current study will provide a better understanding of what influences product health evaluations and consumption awareness. More specifically, if increasing serving size information increases consumption, then this demonstrates that people rely on this value as a cue to determine the amount of calories that they should be consuming. In comparison, if increasing serving size information decreases consumption then this demonstrates that people are more aware that larger values in the nutrition facts table are indicative of a less healthy product, which decreases consumption. As such, the current study has implications for future research and practice. These findings can help develop a better understanding of consumer purchasing and consumption patterns, which could potentially lead to changes in product labelling to increase product health awareness.

6 Hypotheses

The first hypothesis was that the product would be consumed in greater amounts when presented with a healthy product description in comparison to when it was presented with an unhealthy product description. This prediction was based on research that has shown labelling and marketing does have an impact on consumption with foods described as "healthy" being consumed in greater amounts than foods described as "unhealthy" (Provencher, Polivy, & Herman, 2009). Additional research has shown that foods that are described using health-focused descriptions are evaluated more positively on ratings of taste, likelihood of purchasing the product, and product value (Lee, Shimizu, Kniffin, & Wansink 2013; Wansink, 2004). Therefore, in the current study participants were expected to consume more when the product was presented with a healthy product description.

The second hypothesis was that when comparing the estimated calorie consumption and actual calorie consumption there would be a larger discrepancy in the healthy and unhealthy description conditions compared to the no description condition. It was predicted that participants would perceive their caloric intake to be less when the product was described as healthy resulting in an underestimation of caloric intake and more when the product was described as unhealthy resulting in an overestimation of caloric intake. It was predicted that participants who received no product health description would be more accurate at estimating their actual calorie consumption overall because they would only be given serving size information presented in the nutrition facts table. Therefore, they would not be distracted or influenced by the addition of a product health description, which could potentially shift their perceived healthiness of the product and influence their estimation accuracy.

The third hypothesis was that modifying the serving size information would impact consumption levels. According to the Consumption Norm Theory, larger serving size information should increase consumption. This theory states that participants should use the larger serving size information as a cue for what is normal and appropriate to consume and modify their intake accordingly, which would result in higher consumption (Wansink, Painter, & North, 2005). Conversely, according to the Cognitive Distortion Theory, larger serving size information should decrease consumption. This theory states that participants should view the larger serving size and nutritional values as cues that the product is less healthy because the unhealthy nutrient amounts are exaggerated compared to the normal serving size, which would result in lower consumption. Studies have been found that support each of these hypotheses, therefore the direction of the outcome in the current study was unknown.

Chapter Two: Methodology

1 Participants

A total of 150 participants were recruited to take part in this experiment. All participants were female and over the age of 18 years. Participants were recruited from Laurentian University (n=91), as well as throughout the community (n=59). The mean age of participants was 31.47 years (min=18 years/max=73 years, median=22 years). The mean body mass index (BMI) of participants was 25.86 (classified as overweight—between 25.0 and 29.9). According to Diabetes Canada (2018), a normal BMI falls between 19.0 and 24.9. BMI is calculated by dividing the participants weight in kilograms by their height in meters squared to represent their weight relative to their height (Nuttall, 2015). However, it must be noted that although BMI is a commonly used measurement to represent the distribution of adipose tissue in an individual, there are limitations to this method as it does not take into consideration differences in muscle

mass, bone density, and overall body composition. Due to this limitation, BMI is an unreliable measure when examining body builders, long distance athletes, pregnant women, young children, or the elderly (Diabetes Canada, 2018).

The decision to only use female participants was based on previous research showing that females base their product choices on labelling more often than males. For example, McCullum and Archterberg (1997) found that females were more likely than males to use label/nutrition claims when selecting food items. In addition, females expressed more concern with the product's ability to promote weight gain. Another study by Dudhate (2017) found that women are most likely to base purchasing decisions on nutritional information on packaging, compared to men who are most likely to base purchasing decisions on price. This study also showed that women are much more observant when it comes to product packaging, showing more awareness for health claims and expiration dates. There are numerous examples in the literature showing that females tend to be more preoccupied with dieting than men because the media portrays the ideal female body as unrealistically thin (Krones, 2009; Polivy & Herman, 2004). Therefore, using females in the current study was predicted to magnify the impact of manipulating product health description and serving size information.

2 Materials

The current study required the use of a scale with an accurate measurement of grams in order to weigh out the appropriate serving size and measure the actual consumption levels. A step on scale was used to measure participant weight and a measuring tape was used to measure participant height. The product used was Dare Simple Pleasures oatmeal cookies (See Appendix A). The Dare Simple Pleasures oatmeal cookie product was chosen for this experiment because the healthiness of the product can be considered neutral from healthy to unhealthy based on the

values provided in the nutrition facts table in comparison to a random sample of other oatmeal cookie products. In other words, when looking at the amount of calories, fat, sugar, carbohydrates, fiber and protein, the product chosen has average amounts compared to other products with higher or lower levels (See Appendix E). This was done so that participants would not automatically assume based on the values in the nutrition facts table that the product was "healthy" or "unhealthy" and therefore either of the product health descriptions could apply to the product.

The product descriptions and nutrition facts tables were enlarged and printed in order to ensure all participants could read the information (See Appendix B and C). The experiment used three questionnaires. The first was a "taste test" questionnaire that acted as a filler task for participants to complete while they consumed the product (See Appendix D.1). This methodology is consistent with other consumption studies (ex. Provencher, Polivy, & Herman, 2009). The second was a demographics questionnaire, which allowed the experimenter to examine how the participant's personal characteristics impacted their consumption levels and product evaluations (See Appendix D.2). The third was a estimation and rating questionnaire, which allowed the experimenter to analyze how the manipulations impacted the participant's perception of consumption and product evaluations (See Appendix D.3).

3 Procedure

Participants were recruited by the researcher using a recruitment script (See Appendix F). This script was presented to classes at Laurentian University with the permission of the instructor. Recruitment forms were also posted within the community and social media was utilized as a tool to recruit participants. Participants were invited to take part in a "taste test" of an oatmeal cookie product. Participants were informed on the recruitment script that the study

would be looking at how age can impact taste perceptions in females. This was done to conceal the true nature of the study, knowledge of which could impact participant eating decisions. The recruitment script instructed participants to refrain from consuming any food for at least 2 hours before the taste test was scheduled to start. This helped to control for differences in hunger levels, which could have impacted the amount of calories consumed during the experiment. A question was included on the estimation and rating questionnaire asking the participant the last food they consumed and the time of consumption to verify that they had followed this instruction. This information will be analyzed in the results section. Experimental sessions were scheduled for either 10:00am, 3:00pm or 7:00pm. This allowed the researcher to accommodate the participant's daily schedule, while still controlling for differences in consumption due to time of day. These times were chosen because they are between typical meal times (breakfast, lunch, dinner). Participants were assigned relatively equally for each group to each of these timeslots. Participants were assured that the product was made in a nut free/peanut free facility, and told the product did contain wheat, oats, soya and milk. This helped ensure the safety of participants with possible allergies to the product's ingredients. The recruitment script explained that participants would be asked to indicate their age, height, weight, and opinions about the product during the "taste test".

Upon entering the experiment room, participants were provided with an informed consent form to read and complete (See Appendix G). This form is the only document linking the name of the participant to the study. Upon completion, this form was securely locked in a filing cabinet to ensure privacy and confidentiality. Participants were assured of their anonymity through the identification of the participant by a number labelled on the bottom of their plate, which corresponded to a number on the back of their questionnaire package.

Each session was scheduled to have 3 to 5 participants to ensure the researcher could monitor consumption and answer any possible questions. All the participants were seated and presented with the same oatmeal cookie product (See Appendix A). Participants were randomly assigned to one of the six experimental groups. Prior to the participant's arrival, the experimenter weighed and distributed an equal amount of cookies for each participant (8 cookies/124 grams/280 calories—4 times the recommended serving size of 2 cookies/31 grams/140 calories). This amount was chosen because it is common for people to consume double the recommended serving size. For example, Bryant and Dundes (2005) found that when participants were asked to portion a cereal product to represent what they would normally consume, 90% of participants provided a portion that was more than double that of the identified serving size on labelling. Therefore, in order to keep the serving size constant in the current study, a serving size of 124 grams/280 calories was chosen because this is double the amount for the larger serving size with adjusted values.

The questionnaire package corresponded to each plate (ex. #1-5 on the bottom of each plate and the same number on the questionnaire package). There was a total of six groups with 25 participants each. The first group received no health description and the normal serving size information was displayed. The second group received no health description and the larger serving size information was displayed. The third group received a "healthy" product description (visually displayed and participants were instructed to read) and the normal serving size information was displayed. The fourth group received a "healthy" product description (visually displayed and participants were instructed to read) and the larger serving size information was displayed. The fifth group received an "unhealthy" product description (visually displayed and participants were instructed to read) and the normal serving size information was displayed. The

sixth group received an “unhealthy” product description (visually displayed and participants were instructed to read) and the larger serving size information was displayed. The product’s nutrition facts table was visually displayed for all groups with adjusted values for those with larger serving size information.

Participants were instructed to complete the “taste test” questionnaire while they consumed the product (See Appendix D.1). This questionnaire asked participants to rate their opinions of the product, as a normal taste test would. Upon completion of the “taste test” questionnaire the participant’s plates were removed from the table and set aside to be weighed once they indicated they were finished consuming the product. Participants were then asked to complete the demographics questionnaire, as well as the estimation and rating questionnaire (See Appendix D.2 and D.3). Individually, participant height and weight were measured to ensure accurate measurements were provided on the demographics questionnaire. After these questionnaires were completed, the participants were thanked for their participation and provided with a debriefing form (See Appendix H). After all the participants had left the experiment, the researcher weighed each plate and recorded the actual consumption in grams each participant consumed, which was then converted to calories.

4 Variables

The first independent variable was product description, which had three levels. The first level was no product description. The second level was a “healthy” product description, which focused on the health benefits of the product and ignored any mention of possible unhealthy contents. This product description read: “This new product is made with the goodness of whole grain rolled oats. Baked with 10 or less simple and healthy ingredients and containing 2 grams of protein, you can consume this snack while feeling guilt-free. These oatmeal cookies are low in

saturated fat, sodium and contain no artificial colours or flavours" (Also shown in Appendix B). The third level was an "unhealthy" product description, which focused on the contents in the product that are associated with weight gain and indulging while ignoring any health benefits. This product description read: "This new gourmet product is made with the goodness of real butter and old-fashioned brown sugar. Containing indulgent ingredients and a sweet taste, these delectable new cookies are absolutely addicting. You will be reminded of the taste of Grandma's baking as you treat yourself to these delicious guilty pleasures" (Also shown in Appendix B).

The second independent variable was the product serving size information, which had two levels. The first level was a normal serving size and nutrition facts table, as it reads on the product that is currently sold in stores (See Appendix C). The second level was a larger serving size, which was double the normal serving size, and had a nutrition facts table that was adjusted accordingly (See Appendix C). The decision was made to not have a group receive a smaller serving size because previous research has already shown that the normal serving size is significantly less than what the average person actually consumes (Bryant & Dunes, 2005). Therefore, the goal was to determine whether making the serving size information more representative of what a person normally consumes in one sitting would influence consumption.

The first dependent variable was actual calorie consumption, which was measured in grams and converted to calories. Participants were presented with 124 grams/280 calories of cookies and their consumption level was measured by weighing the amount left after the experimental session had ended. Note: If participants consumed the entire serving size presented to them, they were offered an additional plate and the same procedure was followed adding the weight consumed for each plate.

The second dependent variable was an estimation of calorie consumption by participants, which was measured in the estimation and rating questionnaire. This allowed the researcher to compare the estimated calorie consumption to the actual calorie consumption to determine whether varying the product description or serving size information could impact a person's perception of caloric intake.

There was also a number of secondary questions that looked at how product descriptions and serving size information can impact health perceptions. The goal was to determine how the participant identified themselves and whether these identifications led to variations in the dependent variables. The participants were questioned on whether they considered themselves a healthy eater, whether they normally pay attention to the nutrition facts on the products that they consume, whether they have tried to change their weight in the past year through changes in their diet, whether they were currently trying to change their weight through changes in their diet, whether they were currently satisfied with their weight, whether they consume oatmeal cookies in their regular diet (and if so, the brand), as well as what they base their purchasing decisions on while grocery shopping. These questions were chosen because these factors could influence the results of the study, and they could possibly help to better understand who is most likely to be influenced by the manipulations chosen in the study. Participants were also asked how much they would be willing to pay for the product to determine whether manipulating the product description or serving size information could impact the perceived value of the product. This was explored, as previous studies have found that modifying product health information can impact the perceived value of the product (Lee, Shimizu, Kniffin & Wansink, 2013). Finally, a number of questions were included that pertained to the perceived healthiness of the product (ex. how healthy do you feel after consuming this product?), which served as confirmatory questions that

would indicate if the chosen manipulations were working as assumed, as well as assessing individual differences that could have influenced eating decisions (ex. how anxious were you during this experiment?). Although secondary measures, all of these questions served a purpose for understanding the population being used and for explaining potential outliers in the results of the study.

5 Design

This study examined the impact of product health description and serving size information on consumption and estimations of consumption using a 3 (no product description/healthy product description/unhealthy product description) by 2 (normal serving size information/larger serving size information) factorial design. A total of six groups were analyzed with 25 participants in each group (See Table. 1). A 3x2 ANOVA analysis was utilized to examine the effects of each manipulation, which will be discussed in the results section.

	Product Description	**Serving Size Information**
Group 1	No Description	Normal Serving Size Information
Group 2	No Description	Larger Serving Size Information
Group 3	Healthy Description	Normal Serving Size Information
Group 4	Healthy Description	Larger Serving Size Information
Group 5	Unhealthy Description	Normal Serving Size Information
Group 6	Unhealthy Description	Larger Serving Size Information

Table 1, Experimental Groups.

Chapter Three: Results

1 Demographic Variables

A number of factors that could potentially impact the validity of the results were taken into consideration before conducting the analyses required to examine overall mean consumption, estimations of consumption, and health perception variables between groups. These factors included: whether the participant had eaten in the 2 hours prior to participating, the group size

during the session, the time of day during which the session was conducted, differences between BMI groups, as well as differences between age groups. Exploratory analyses examined whether participants in each BMI and age groups varied on measures of the dependent variables to help identify participant characteristics that may have impacted the study, as well as to help gain a better understanding of the factors that influence consumption and health perceptions overall.

The questionnaire provided to the participant required that they indicate the last food they consumed and the time of consumption. This question was included to confirm that participants followed the instruction to avoid consuming any food at least 2 hours prior to the experiment, as this could interfere with their level of hunger and impact the results. The results showed that 20 participants out of 150 did in fact consume food within the 2-hour time frame prior to the experiment. To explore whether this variable had an impact on the results, an analysis was run to determine the differences in consumption for those who had consumed food in the 2-hour time frame prior and those who had not. It was found that those who had consumed food in the 2-hour time frame prior ($M=121.65$ calories, $SD=47.98$) and those who had not ($M=176.22$ calories, $SD=134.43$) did not vary significantly on consumption during the experiment. In addition, the analyses were run excluding these participants and the results did not change, which will be presented in the next section. Therefore, these participants were included in the remainder of all analyses.

The researcher recorded group size for each participant to determine whether this variable had an impact on consumption. Participants were all scheduled to participate in the experiment in groups of 3 to 5. However, due to cancellations, group size did vary from 1 to 5 participants per session. The study was to be completed individually, therefore group size was not predicted to impact the results. However, it was important to explore whether having other participants

complete the study at the same time in the same vicinity may have had an impact on consumption patterns. The analysis showed that 11 participants participated individually (M=142.10 calories, SD=62.78), 24 participants participated in groups of 2 (M=225.55 calories, SD=230.01), 33 participants participated in groups of 3 (M=148.86 calories, SD=85.86), 52 participants participated in groups of 4 (M=181.05 calories, SD=133.81), and 30 participants participated in groups of 5 (M=134.64 calories, SD=67.61). The differences between these groups were statistically nonsignificant, and therefore it can be concluded that there was no significant effect of group size on consumption during the experiment.

Another variable that was explored was whether time of day had an impact on consumption. Experimental sessions were held at one of three times: 10:00am, 3:00pm, or 7:00pm. An analysis was run to determine whether there was a difference in consumption between those participating at each of these times. It was found that there were no significant differences between groups. The mean calorie consumption for those participating at 10:00am, 3:00pm, and 7:00pm being 191.88 calories (SD=175.04), 145.08 calories (SD=67.33), and 170.69 calories (SD=101.89), respectively. Therefore, there were no significant impacts of time of day on consumption during the study.

An analysis was run to determine whether there was a significant difference between those with a normal BMI and those with a BMI considered “overweight” or “obese”, as this could be a variable that influenced consumption. The analysis compared the calories consumed during the experiment for those with a normal BMI (at or below 24.9) and those with an overweight or obese BMI (over 24.9). The results of this analysis showed no significant differences between those having a normal BMI (M=186.36 calories, SD= 155.71) and those having an overweight or obese BMI (M=154.12 calories, SD=96.11) for calories consumed

during the experiment. Therefore, there was no significant impact of BMI on consumption during the experiment.

An additional analysis was conducted to determine whether there was a significant difference in consumption between those who were 30 years old and under and those who were over the age of 30. The analysis showed that 94 participants were 30 years and under, compared to 56 participants who were over the age of 30. A significant difference in overall consumption was found for these age groups. Those 30 years and under (M=188.49 calories, SD=148.30) consumed significantly more than those over the age of 30 (M=136.15 calories, SD=71.96). $F (1, 148) = 6.85$, $p < .05$, n^2=.44. Although those under the age of 30 consumed significantly more overall, they were no more accurate at estimating their calorie consumption (M=-6.65 calories, 112.34), than those 30 years and over (M=-25.04 calories, SD=130.55). When the analyses were run for each of these age groups separately, the findings remained the same overall for the manipulations introduced, therefore although important to take into account, this variable did not impact the overall results of the study. It is also important to note that although participants recruited from Laurentian University were younger overall (M=23.23 years) they did not differ significantly in consumption (M=184.63, SD=150.58), when compared to those recruited from the community (M=144.76, SD=75.31) who were older overall (M=44.17 years). These findings will be expanded upon in the discussion section.

Furthermore, it was found that participants 30 years and under differed significantly in BMI compared to those who were over 30 years. Those who were 30 years and under (M=24.61, SD=4.55) had a significantly lower average BMI than those over the age of 30 (M=27.91, SD=5.08). However, there is a potential explanation for this finding. The measurement of BMI fails to take into account age, and as such, ignores important factors that may influence weight,

such as hormonal weight changes—for example, those caused by pregnancy or menopause. Research has shown that BMI tends to increase gradually peaking at the age of 50 to 60 years and then gradually decreasing (Nevill & Metsios, 2015).

2 Actual Calorie Consumption

A 3(no description/healthy description/unhealthy description) x 2(normal serving size information/larger serving size information) ANOVA was conducted. In analyzing actual calorie consumption, a main effect of serving size information was found. Participants who received the larger serving size information (those who received the nutrition facts with a doubled serving size and adjusted nutritional values to reflect this serving) consumed significantly less (M=139.92 calories, SD=98.88) than those who received the normal serving size information (M=197.98 calories, SD=145.96) (see Figure. 1). $F (1, 144) = 8.08$, $p < .05$, $\eta^2=.03$. This finding demonstrates support for the Cognitive Distortion Theory, as the larger serving size information may have signaled to participants that the product they were consuming contained more calories. The exaggerated values could have led them to assume the product was less healthy, and therefore they chose to consume less of the product.

There was no main effect found for product description and no interaction between product description and serving size. Those in the no product description group (M=177.21 calories, SD=146.45), healthy product description group (M=179.90 calories, SD=149.94) and the unhealthy product description group (M=149.73 calories, SD=70.87) did not vary significantly on consumption during the experiment. As such, it can be concluded that the product description manipulation was either not salient enough as a stimulus, the serving size information was a more meaningful indicator of product healthiness or the notion may have already existed that oatmeal cookies were “healthy”. In Figure 1, the data shows similar results

for those who received no product description and those who received the healthy product description for calorie consumption suggesting that only the unhealthy product description had an influence on actual consumption.

Similar results were found when the data was analyzed excluding those who indicated on the questionnaire that they had consumed food within the 2-hour time frame prior to participating in the experiment (n=20). Participant who received the larger serving size information consumed significantly less (M=144.60 calories, SD=105.15) than those who received the normal serving size information (M=206.89 calories, SD=152.34). $F\ (1, 144) = 8.08$, $p < .05$, $\eta^2 = .03$. $F\ (1, 129) = 7.28$, $P < .05$, $\eta^2 = .05$ (See Figure 2). Again, no effect of description type was found.

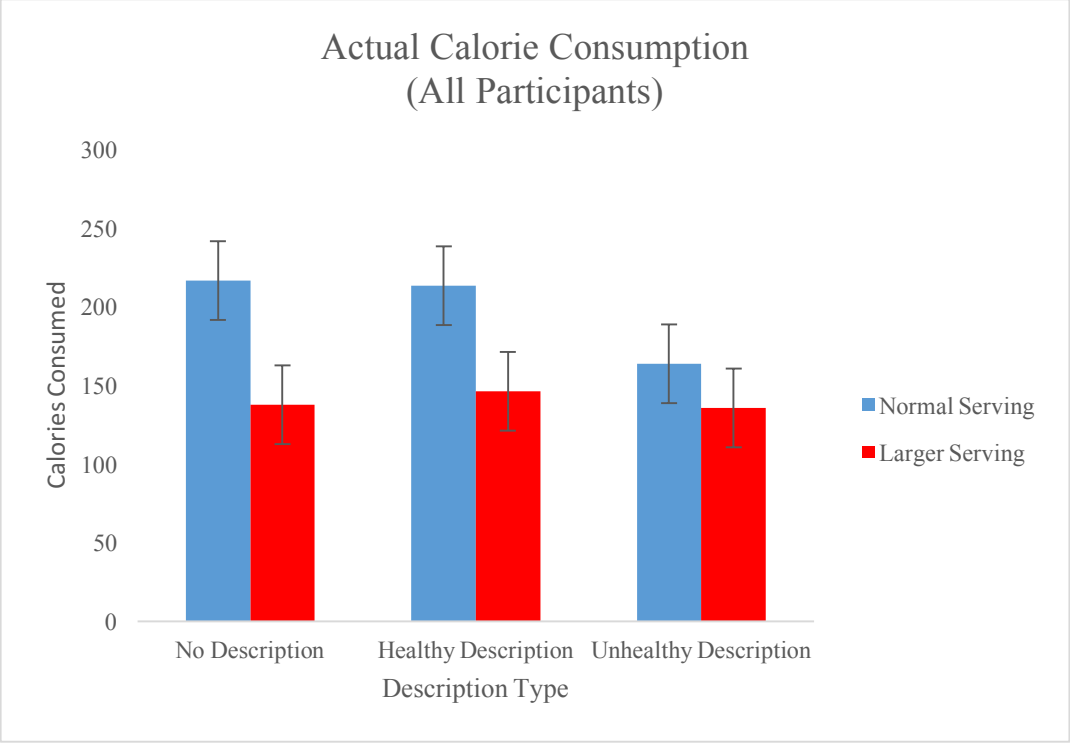

Figure 1. The Impact of Serving Size Information on Calorie Consumption. The error bars represent the standard error of the mean. A main effect of Serving Size Information was found.

$F\ (1, 144) = 8.08$, $p < .05$, $\eta^2 = .03$

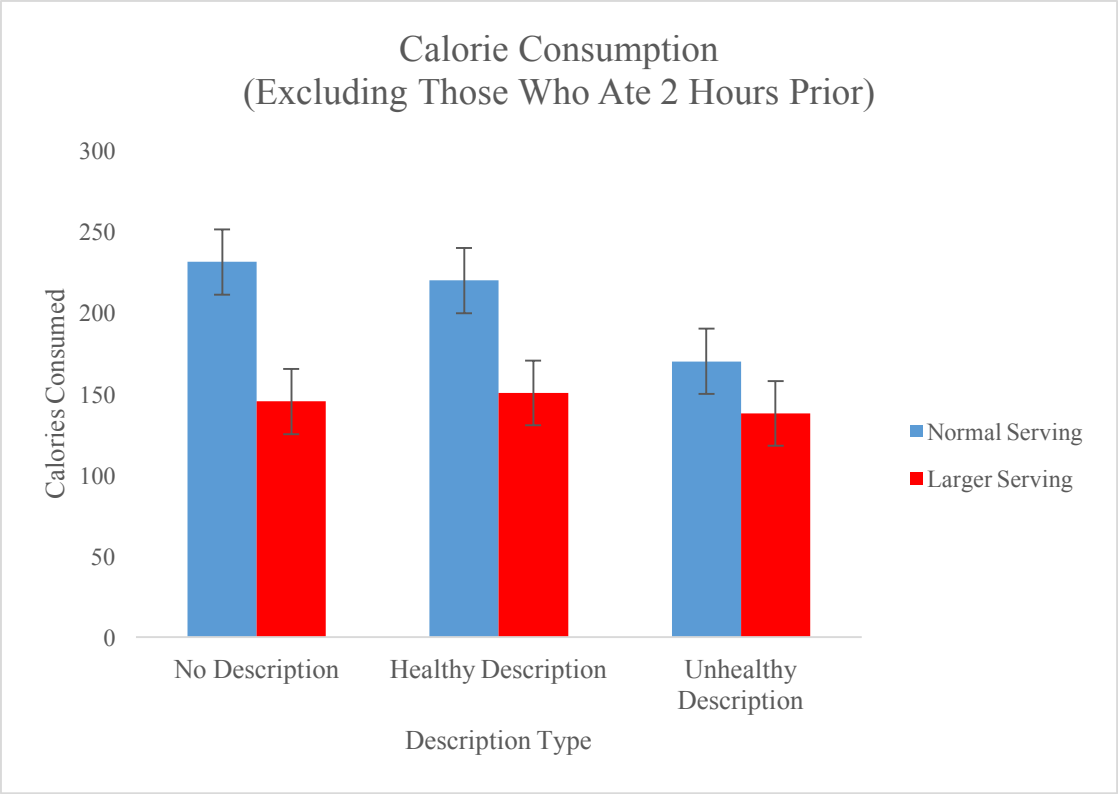

Figure 2. The Impact of Serving Size Information on Calorie Consumption Excluding Those Who Ate 2 Hours Prior (n=20). The error bars represent the standard error of the mean. A main effect of Serving Size Information was found.

$F\ (1, 129) = 7.28, p < .05, \eta^2 = .05$

3 Estimations of Calorie Consumption

A 3(no description/healthy description/unhealthy description) x 2(normal serving size information/larger serving size information) ANOVA was conducted. The first way to analyze estimations of calorie consumption is to look at the overall level of accuracy or total distance from zero, which would mean that all of the values would be positive and represent the distance from zero to the estimation regardless of whether this value is positive or negative. The reason the choice was made to analyze the data this way was that this analysis shows us how far off the average person was at estimating their actual consumption. However, this analysis does not provide details regarding the direction of the error, which will be discussed next. Overall, the

results showed that participants were off by an average of 76 calories when estimating their actual calorie consumption. In analyzing the estimations of calorie consumption this way, a main effect of serving size information was found. Participants who received the larger serving size information were significantly more accurate at estimating their actual calorie consumption (M=57.42 calories, SD=73.97) than those who received the normal serving size information (M=94.70 calories, SD=109.68). Overall, these values show us how far off the estimate the participant provided was from their actual calorie consumption (See Figure. 3). $F (1, 144) = 5.83$, $p < .05$, $\eta^2 = .039$.

Therefore, this analysis shows that when looking at overall calorie estimation accuracy regardless of direction (overestimation or underestimation), the average person would be more accurate at estimating their calorie consumption when provided with the larger serving size information (off by an average of M=57 calories) than those who received the normal serving size information (off by an average of M=94 calories). This demonstrates that participants who received the larger serving size information were more accurate at estimating their actual consumption overall. It is possible that these individuals paid more attention to the values provided in the nutrition facts table, which allowed them the ability to better estimate the number of calories they chose to consume.

In analyzing total accuracy, description type did not have a significant impact on calorie estimation accuracy. Participants who received no product description (M=82.87 calories, SD=104.86), a healthy product description (M=76.06 calories, SD=96.24), or an unhealthy product description (M=58.55 calories, SD=73.91) did not significantly differ on calorie estimation accuracy. Participants may have relied more heavily on the serving size information

to determine their estimations of calorie consumption, as the nutrition facts table indicated the number of calories per serving and therefore it may have been a more useful tool to consider.

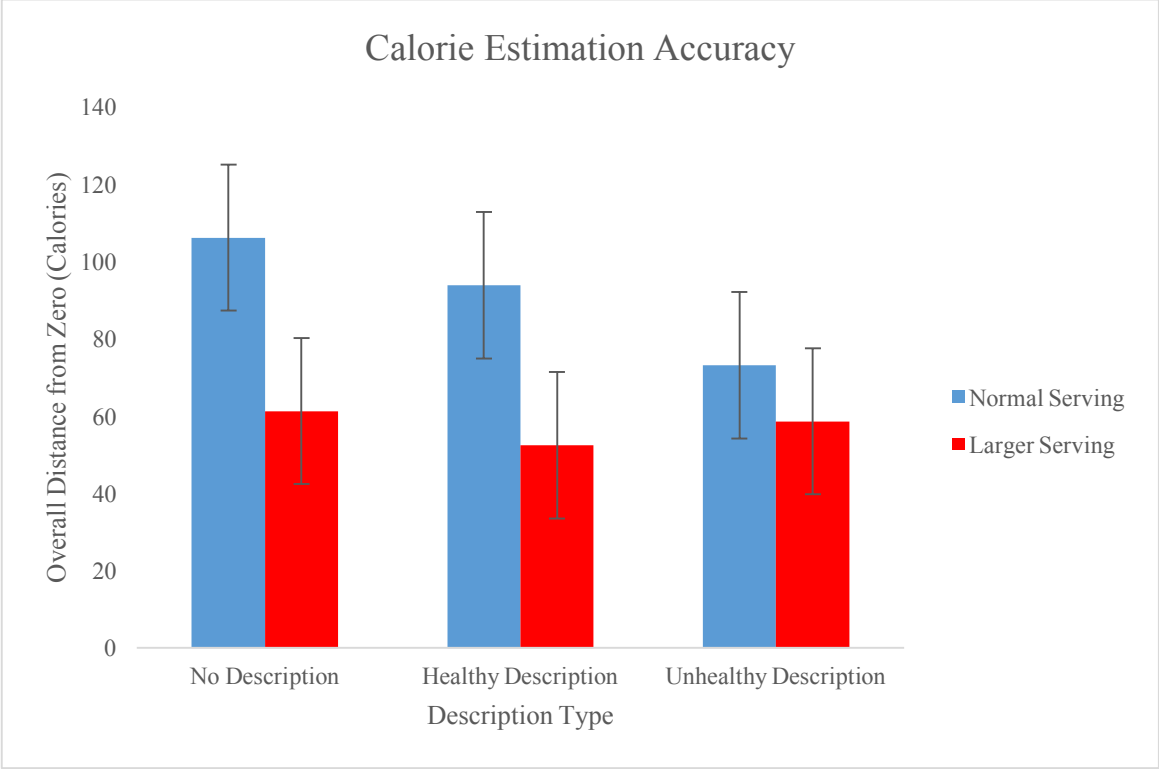

Figure 3. Calorie Estimation Accuracy. The error bars represent the standard error of the mean. A main effect of Serving Size was found.

$F(1, 144) = 5.83$, $p < .05$, $\eta^2 = .039$.

The second way of analyzing estimations of calorie consumption is to analyze mean differences between actual and estimated calorie consumption. In analyzing the data this way, a main effect of description type was found. Participants who received a healthy product description were more likely to underestimate their actual calorie consumption (M=-52.70 calories, SD=92.25) compared to those who received no product description (M=-6.72 calories, SD=132.81) or an unhealthy product description (M=7.89 calories, SD=127.14) (See Figure. 4). $F(2, 144) = 3.82$, $p < .05$, $\eta^2 = .049$. In other words, this analysis shows that when looking at mean differences between actual and estimated calorie consumption, the overestimations and

underestimations balance out for those who received no description and an unhealthy description because the mean differences found were relatively small. In comparison, those who received the healthy product description were overall more likely to underestimate their estimation of calorie consumption because the mean difference is negatively skewed, and quite significantly. Furthermore, no significant differences were found for mean differences between those in the normal serving size groups (M=-26.23 calories, SD=142.90) and the larger serving size groups (M=-3.98 calories, SD=93.83). These findings demonstrate that while larger serving size information leads to more accurate caloric intake estimations overall, these differences do not have a significant influence on the direction of error in comparison to product health descriptions.

While participants were also asked to estimate their consumption in grams, the results were shown to be random and significantly inaccurate overall across groups. On average, participant's estimation of their consumption in grams was off by 38.72 grams (larger than a serving size of approximately 2 cookies=31 grams). Taking into consideration that the majority of participants consumed between 2 and 3 cookies during the experiment, this is a large inaccuracy. Estimations of grams consumed during the study varied from extreme underestimations of above 100 grams, to extreme overestimations of over 300 grams total demonstrating that overall, participants were not accurate at estimating their consumption in grams. This is why the entire analysis was run using calorie estimation, as this data was more meaningful. This finding will be expanded upon in the discussion.

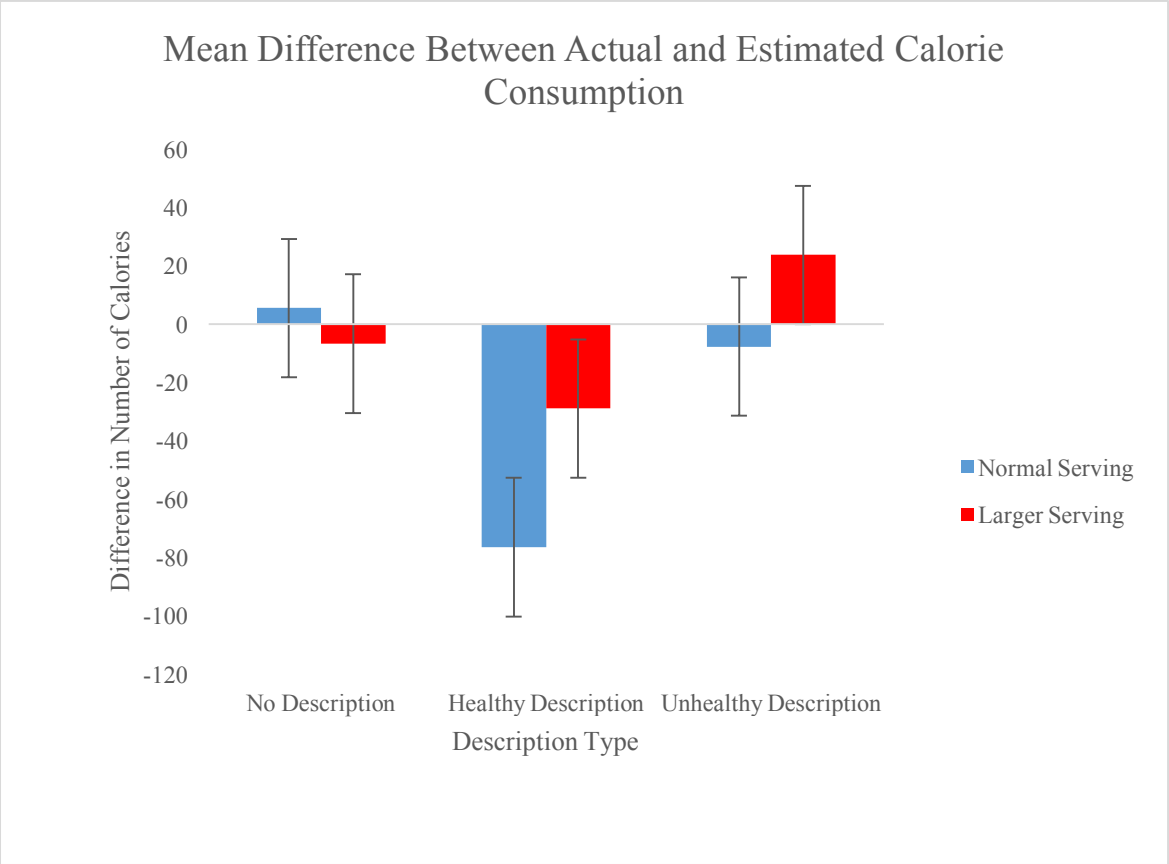

Figure 4. The Mean Difference Between Actual and Estimated Calorie Consumption. The error bars represent the standard error of the mean. A main effect of Description Type was found.

$F(2, 144) = 3.82$, $p < .05$, $\eta^2 = .049$.

4 Secondary Findings

Across all participants, the mean calorie consumption was found to be 168.95 calories, SD=127.61 (28.95 calories above the normal serving size of 140 calories displayed on current packaging). When questioned about what they base their purchasing decisions on, it was found that 34% of participants reported "health information", 33% reported "taste", 29% reported "price", 3% reported "packaging", and 1% reported "other" (see Figure. 5).

Participants were also required to answer introspective questions related to their perceptions of their eating behaviours and their weight (see Table. 2). It was found that 63% of participants reported that they consider themselves a healthy eater. Overall, 49% of participants

reported that they pay attention to the nutrition facts table on the products that they consume. At the time of the study, 54% of participants reported that they were currently trying to change their weight through changes in their diet and 62% of participants reported that they had tried to change their weight through changes in their diet over the last year. Results also showed that only 42% of participants reported that they were currently satisfied with their weight. These results did not differ significantly across groups.

Consumption differences were analyzed for those who indicated "yes" versus those who indicated "no" on each of the questions and no significant differences were found. In other words, there were no differences in consumption between self-proclaimed "healthy" versus "unhealthy" eaters, for those who reported that they pay attention to the nutrition facts table on products compared to those who reported that they do not, for those who have tried to change their weight through changes in their diet or who were currently trying to change their weight through changes in their diet compared to those who were not, for those who were satisfied compared to those who were unsatisfied with their weight, and for those who regularly consume oatmeal cookies compared to those who do not. In addition, no significant differences in calorie estimation were found for these groups.

The mean price that participants were willing to pay for a box containing 20 cookies of the product was $3.85. The actual retail price of the product is $3.69. For product health description, the no description, healthy description, and unhealthy description groups had an indicated mean price of $3.72, $4.30, and $3.54, respectively. Those who received the normal serving size information had an indicated mean price of $3.96 compared to those who received the larger serving size information who had an indicated mean price of $3.74. There were no significant differences found in the monetary value of the product between any of these groups.

When trying to determine if the product descriptions could influence consumer's buying behaviour we found that healthy descriptions led to a higher likelihood of purchasing the product in the future. An independent samples t-test was conducted comparing those who received the healthy product description compared to those who received the unhealthy product description. The results (9-point Likert scale) showed that those in the healthy groups were significantly more likely to report that they would purchase the product in the future (M=4.90, SD=2.99) compared to the unhealthy group (M=3.78, SD=2.41). $t(98) = 2.06$, $p = .04$, Thus, the same product presented with a healthy description is considered more appealing and increases the likelihood the product will be purchased regardless of the actual nutritional content.

Participants were also asked to indicate on a 9-point Likert scale, their perceptions of the product and themselves after consuming the product. No significant differences in mean values were found for how healthy the participant felt after consuming the product (no description=4.00, healthy description=4.48, unhealthy description=3.86—normal serving=4.17, larger serving=4.05), how guilty they felt after consuming the product (no description=3.32, healthy description=3.30, unhealthy description=3.32—normal serving=3.37, larger serving=3.45), how guilty they would feel if they were consuming the product on a regular basis (no description=5.20, healthy description=5.12, unhealthy description=5.70—normal serving=5.07, larger serving=5.61), how likely it would be that they would gain weight if they consumed the product on a regular basis (no description=3.44, healthy description=2.96, unhealthy description=3.66—normal serving=3.24, larger serving=3.47) or how ideal the product was for personal taste (no description=5.30, healthy description=5.08, unhealthy description=4.82—normal serving=5.44, larger serving=4.69). Although statistically nonsignificant, these results are approaching significance and on trend for what would be

expected (generally more positive ratings for those in the healthy product description groups compared to the unhealthy product description groups). No differences were found on self-ratings of anxiety levels during the experiment and in general, or whether hunger level played a role in the amount consumed during the study. Results also indicated that participants would feel significantly guiltier if they were consuming the product on a regular basis (M=5.34, SD=2.40) compared to how they feel after consuming the product for the purpose of the experiment (M=3.41, SD=2.78). t (149) = -11.42, P < .001

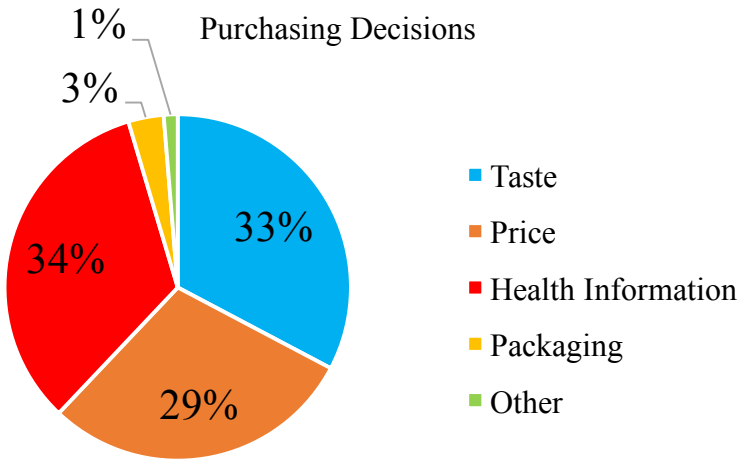

Figure 5. Purchasing Decisions. What participants reported on the questionnaire that they base their purchasing decisions on.

Percentage of participants who consider themselves healthy eaters.	63%
Percentage of participants who reported they pay attention to the nutrition facts table on the products that they consume.	49%
Percentage of participants who reported that they have tried to change their weight in the last year through changes in their diet.	62%
Percentage of participants who reported that they were trying to change their weight through changes in their diet at the time of the experiment.	54%
Percentage of participants who reported that they were satisfied with their weight.	42%

Table 2. Overall Percentages. The percentage of participants who reported "yes" to the questions pertaining to their eating behaviours and weight (based on n=150).

Chapter Four: Discussion

1 Calorie Consumption

The mean calorie consumption for participants in the study was M=168.95 calories, SD=127.61. Taking into consideration that 54% of participants reported that they were currently trying to change their weight through changes in their diet, they still consumed on average more than the typical serving size presented on packaging. Taking the previous statistic into consideration, as well as the fact that only 42% of participants reported being satisfied with their current weight, they still chose to consume on average approximately 21% more calories than what is displayed on the nutrition facts table of current packaging. This demonstrates that even when partaking in a consumption experiment that should make the participant even more aware of their consumption than usual, they still consumed on average more than what is displayed on packaging. In a more natural setting, it is likely that participants would consume even larger amounts, as research has shown people tend to consume more while in the company of friends or family and less while in the company of strangers (Anderson, 2013). Due to a large degree of variability in consumption between subjects, future studies should focus on controlling for differences in hunger level and prior consumption (time prior and amount), as this factor likely had a large influence on the study.

The first hypothesis proposed by the researcher predicted that the product would be consumed in greater amounts by those who received the healthy product description, however this hypothesis was not supported. There were no significant differences in consumption across the three product description groups (no description, healthy description, unhealthy description). Rather, the serving size information is what significantly impacted consumption. It is possible that participants focused more heavily on the nutrition facts table since both the product

description and nutrition facts table were presented on the same page for participants. The exaggerated numeric values in the nutrition facts table for the larger serving size information potentially stood out to participants as more meaningful than the product description. This may have given them the opportunity to formulate their own opinions regarding the healthiness of the product (ex. higher calories, higher fat, higher sugar=unhealthy), which in turn influenced their consumption.

In comparison to previous studies, such as the results by Provencher, Polivy and Herman (2009), who found that modifying product health descriptions can have an impact on consumption, the current study introduced additional variables (serving size information), which may have actually interfered with the effectiveness of the product health description in modifying health perceptions. To further explain, numerous studies have shown that providing health suggestive labels or descriptions can impact consumption with healthy information increasing consumption and unhealthy information decreasing consumption (Provencher, Polivy & Herman, 2009; Wansink & Chandon, 2007; Wansink & Chandon, 2006). However, a main difference with these studies is that the nutrition facts table was not actually presented along with the health labels or description. Therefore, the participants based their eating decisions on limited health information, rather than actual nutritional content. The current study has more external validity because in the real world products are sold with the nutrition facts and serving size information on packaging. It is possible that in the current study, participants used the nutrition facts table to create their own assumptions about the healthiness of the product rather than relying on only the health description provided. Thus, the health information provided may not have been a salient enough stimulus to impact health perceptions in comparison to the nutrition facts table, which a person would encounter when purchasing products in the real world.

The findings of this study support the Cognitive Distortion Theory, which predicted that the exaggerated values in the nutrition facts table when the serving size information was doubled would lead to a decrease in consumption. Similar to the results of Hydock, Wilson and Easwar (2016), the current study found that increasing serving size information led participants to consume significantly less calories. These results refute the Consumption Norm Theory, which states that increasing serving size should increase consumption. A previous study that supported the Consumption Norm Theory was presented by Spanos, Kenda, and Varanian (2014), who found that increasing serving size information leads to an increase in consumption. A key difference between this study and the current study is that participants in the current study were presented with the nutrition facts table. In comparison, participants in the study by Spanos, Kenda, and Varanian (2014) were not presented with any information beyond the number of servings in the pizza presented to them. Thus, these participants were unaware of the calorie content, fat content, and sugar content, which have been shown in previous studies to be important factors that consumers focus on when making purchasing and consumption choices (Graham & Jeffery, 2011; McCullum & Archterberg. 1997). A possible explanation is that the larger values in the nutrition facts table signaled to participants that the product was less healthy and as such, they made the decision to consume less of the product.

2 Estimations of Calorie Consumption

When analyzing calorie estimation accuracy (in terms of total distance from zero), it was found that participants who received the larger serving size information were more accurate overall at estimating their actual calorie consumption. It is likely that participants allocated more of their attention to the larger values and that they were more memorable and meaningful compared to the normal values because these participants were better able to estimate their actual

consumption. Thus, a potential explanation for these findings may be that participants were more cognizant of the larger serving size information than the normal serving size information as the values stood out as unhealthy and thus they were able to make more accurate estimations because the exaggerated values were more memorable. These findings support the research by Garretson and Burton (2000) showing that increasing the amount of unhealthy nutrients in a serving can influence the perceived healthiness of the product, while increasing the amount of healthy nutrients has no effect on perceptions and thus consumption, as demonstrated in the current study.

When analyzing mean differences between actual and estimated calorie consumption, this is where product descriptions had a significant impact. The results showed that participants who received the healthy product description significantly underestimated the amount of calories they had consumed in comparison to those who received no description or an unhealthy product description. This demonstrates that participants who received the healthy product description were impacted by the information presented skewing their perceptions of the product to be more positive. These individuals believed that the product contained fewer calories due to the fact that they were presented with a healthy description. This validates that marketing and advertising can influence how consumers view the calorie content of a product, which relates to the findings of previous studies showing that participants tend to underestimate the calorie content in meals from restaurants that are advertised as healthy (Wansink & Chandon, 2007). Thus, the second hypothesis made by the researcher was partially supported because having a healthy product description did lead to an underestimation in calorie consumption, however having an unhealthy product description did not result in an overestimation, as previously predicted. The groups who received no product description were no more accurate overall than the groups who received the

unhealthy product description. The results of the current study are in line with the results of Wansink and Chandon (2007), who found that consumers tend to underestimate the calories in foods that are marketed as "healthy". Similar to their study showing that participants underestimate the calorie content of foods from Subway, the current study showed that the "health halo" effect can also be applied to cookies, as the same oatmeal cookie product described using a healthy description was perceived to be significantly lower in calories. The results of the current study are also in line with those published by the USDA in 2000 stating that people are generally inaccurate at estimating their caloric intake. The USDA (2000) found that consumers tend to underestimate their consumption of grains, fats, and sugars. The current study supported these findings, while also demonstrating that product health descriptions and serving size information play an important role in perceived caloric intake.

3 Limitations

Participant characteristics in the current experiment that may have impacted consumption include: participant BMI, age, as well as differences in physical activity levels (which was not analyzed in the questionnaires). An attempt was made to control for these variables through the use of randomization. Another possible variable is variation in participant hunger levels. The effect of this was minimized by asking participants to refrain from consuming any food at least 2 hours prior to the experiment, however as previously noted, not all participants followed this instruction. Although this variable would not systematically affect one group over another, it must be acknowledged that the large variability in consumption is likely due to the differences in the last time the participants ate and how much they ate (ex. those who ate 3 hours prior vs. those who ate 12 hours prior; those who ate a large meal vs. those who ate a small snack). Future studies may want to be even more specific when it comes to limiting intake prior to the study.

For example, increasing the amount of time before the study the participant is not to consume any food (ex. 4 hours instead of 2), or being more specific with limiting large meals before participation.

Another limitation in the current study is the choice to use oatmeal cookies. As mentioned previously, it is likely that there was a preconceived notion that "oatmeal cookies" are healthy even though the goal was to choose a product that was considered neutral on a scale from healthy to unhealthy. Based on the results shown in Figure 1, it is apparent that participants consumed similar amounts in the no description and healthy description groups. Therefore, the assumption can be made that it was only the unhealthy description that actually had any influence on health perceptions. Therefore, choosing an alternative product may have resulted in different results and further investigation is needed, however this is a potential explanation for why the unhealthy product description did not lead to an overestimation of calorie consumption compared to the healthy product description, which led to an underestimation of calorie consumption.

As discussed previously, the eating environment can largely impact consumption behaviour (Wansink, 2010). In the current study, multiple controls were put in place to reduce these factors, for example, using the same plates for each participant. However, it is possible that certain environmental differences may have had an impact on consumption choices. Experimental sessions were conducted in different rooms at Laurentian University and within the community. As a control, distractions were limited, participants were all provided the same set up at their table, and the same procedure was followed with each participant.

It is important to note that sessions for the experiment were conducted at three different times throughout the day. To control for the impact of this variable, participants across

experimental groups were scheduled randomly and relatively equally at one of three possible times throughout the day: 10:00am, 3:00pm, or 7:00pm. These times were chosen because they are between typical meal times (breakfast, lunch, dinner) throughout the day. Ideally, all sessions would be conducted at the same time, however participants were given these choices to accommodate their daily schedules. Results showed that time of day did not have a significant effect on overall consumption during the study.

One limitation of any experimental study on consumption is that people tend to eat more in the comfort of their own home or when distracted by their environment (Ogden et al., 2013). In the current study, participants were given the nutrition facts information for the product, told to complete a "taste test" questionnaire, and were most likely aware that the experimenter would know the general amount that they consumed. Despite this awareness, participants still chose to consume on average more than the typical serving size displayed on packaging demonstrating that it is likely that in a more natural environment consumption would be even higher.

Another potential limitation in the current study is that group eating has been found to impact consumption. For example, studies have shown that normal weight individuals tend to eat more in group settings and overweight individuals tend to eat less in group settings (Herman, 2015). When participants in the current study were analyzed overall in terms of BMI groups with 18.0-24.9 being classified as a "normal" BMI and over 25.0 being classified as an "overweight/obese" BMI, it was found that there was not a significant difference in consumption between groups. Those in the normal group (M=189.83, SD=15.10) did not consume significantly more than those in the overweight/obese group (M=152.27, SD=13.84). However, those who were 30 years old and under (M=188.49, SD=148.30), did consume significantly more than those over the age of 30 (M=136.15, SD=71.96). In addition, the mean BMI for those 30

years and under (M=24.61, SD=4.55) was also significantly lower than for those over the age of 30 (M=27.91, SD=5.08). Therefore, group eating effects can have an impact on the results of a study on consumption, as those over the age of 30 were more likely to be overweight/obese and this group consumed significantly less during the study.

One potential explanation in regards to why women over the age of 30 consumed less during the study is that older women who are "overweight" or "obese" may be more preoccupied with societal judgements regarding serving sizes causing them to eat less in groups or in an experimental setting where they are made even more aware of their caloric intake than usual (Khazan, 2014). Gallup (2013) conducted a study to determine the percentage of the general population that pay attention to calorie labels and to pinpoint characteristics that make a person more or less likely to allocate attention to the nutrition facts table on packaging. It was found that those most likely to pay attention to calorie labels were Caucasian women who were over the age of 30 and had higher levels of education, earning $75,000 or more. Similar to other studies previously discussed (McCullum & Archterberg, 1997), Gallup (2013) also suggested that because overweight or obese women are harshly stigmatized, women tend to use their resources to stay slim as this is what is socially preferred resulting in a heightened awareness of nutritional information on packaging.

Bowers and Suzuki (2014) conducted a similar study and found that among women, those who were overweight were the most likely to read nutrition labels, as they were also the most likely to already be actively trying to lose weight. Despite the fact that previous studies have found women over 30 pay the most attention to nutrition labels (Gallup 2013), in the current study, this group was no more accurate at estimating their overall caloric intake than those 30 years and under. It can be speculated that participants in the current study may have been

preoccupied with ensuring their serving size was “appropriate” compared to those around them, thus interfering with their ability to estimate their own consumption. Therefore, it is possible that group eating effects did have an impact for women over the age of 30 in this study and as such, it must be acknowledged as a potential limitation.

The current study demonstrated that overall participants are inaccurate when it comes to estimating their consumption in grams. Proposed changes to food labelling in Canada includes having practical volume measurements (ex. pieces/cups) in addition to weight (ex. grams, ounces) when applicable. It has been shown that weight measurements are more accurate when it comes to measuring calorie dense solids. For example, a cup of loosely packed brown sugar contains 551 calories, whereas a tightly packed cup contains 836 calories (Penner, 2017). However, in general people are much more likely to measure using familiar measurements, such as cups because they are cheaper, easier, and more portable options (Penner, 2017). Future studies should look further into the implications of measuring using these methods and explore whether those who use a scale regularly are more accurate at estimating calorie content and whether this translates into a lower likelihood of obesity.

As with all experimental studies, there are limitations on what conclusions can be drawn from the results and generalized to the entire population. The results of this study are specific to women over the age of 18 years, which means that modifying product health descriptions and serving size information may have different effects for men and women under the age of 18. In addition, the results are specific to Dare Simple Pleasure Oatmeal cookies. If the study was conducted with a different type of food or a different brand of oatmeal cookie, the results may have varied.

4 Future Studies

Although the current study speaks to participant's attention to calorie content, the study fails to take into account attention to the 13 core nutrients also included on the nutrition facts table (total fat, saturated fat and trans fats, cholesterol, sodium, carbohydrates, fibre, sugars, protein, Vitamin A, Vitamin C, calcium, and iron). Graham and Jeffery (2011) found in an eye-tracking study that when presented with a nutrition facts table, participants view the components at the top of the label for longer than the components towards the bottom. They asked participants to make hypothetical purchasing decisions based on information presented on the screen (price, description, photograph of the product, ingredient list, and nutrition facts table). They found that 71% of participants focused on the calorie content, over half of participants viewed the first five components of the nutrition facts table (serving size, calories, total fat, saturated fat, and trans fat) and less than 3% of participants viewed all components in the table. It would be important for future studies to take into consideration what exactly an individual is attending to when presented modified serving size information and how they are using this information to make consumption decisions to expand on these findings.

There were certain decisions made in the current study to ensure the researcher could collect a sufficient number of participants to complete the project in a timely manner. As a result, there are limitations on what conclusions can be drawn from the findings and future studies could look further into these areas. The current study only chose two conditions for the serving size information. Participants were only presented with either the normal serving size or a serving size that was double that of the normal serving size. It would be beneficial for future studies to manipulate serving size information further to determine the impact of having less drastic changes or even more drastic changes to the typical serving size on packaging.

Furthermore, the current study only used a single product in a single serving size to determine how modifying health descriptions and serving size information can impact consumption. Therefore, the findings of this study cannot be generalized to other types of foods or even all cookies, as the results may vary for products (ex. oatmeal raisin vs. oatmeal chocolate chip; bite-sized cookies vs. jumbo cookies). Wansink and Chandon (2006) found that participants tend to significantly underestimate the number of calories in large meals (off by -22.6 to -38%) while having almost perfect estimations of calorie intake for smaller meals (off by -2.9 to 3%). Therefore, it would be crucial to analyze how calorie estimation accuracy changes based on the serving size presented to participants (ex. presenting participants with 2 or 4 rather than 8 cookies, which was used in the current study). It would also be important to replicate the study using a variety of foods and brands to determine whether the results remain constant.

Future studies should also analyze the impact that pictures and slogans can have on purchasing decisions and consumption. This may involve comparing foods with a simple "no-name" label to foods that have flashy packaging and widely marketed branding. It would be beneficial to determine whether more neutral packaging would allow consumers to focus more on nutritional information rather than front label claims, as well as whether health perceptions change based on the types of pictures presented. Furthermore, it would be beneficial to determine the impact of labelling products as "value-size", which is a method often utilized by companies. Studies have found that people are more likely to upgrade food and drink sizes when buying the larger product saves them money (ex. $2 for a small drink or $3 for a large drink—triple the size of a small drink— "supersize"). However, doing so has also been shown to lead to higher consumption, contributing to the growing rates of obesity (Vermeer, Steenhuis & Seidell, 2010).

The element of choice was not tested in the current experiment; however, this is an important aspect to examine as consumption is based highly on purchasing decisions.

Perceptions of "normal" serving sizes have changed as packaging and portion sizes have increased (Chandon, 2012). For example, since McDonald's first opened in 1955, their soda cups have increased more than four times (30 fluid ounces) the size of the original (7 fluid ounces) (Shah 2015). One goal for reducing rates of obesity may be reverting back to smaller portion sizes. For example, just as the "large" cup became the new size of the "medium" cup and the "large" cup became an even larger size than the original; future modifications could see the "small" become the new medium, and a smaller size become the new small. Research showing what environmental factors increase consumption can also be applied to decrease consumption by leading people to eat better without even being consciously aware of these changes ("downsizing" rather than "supersizing"). Studies should therefore focus on subtle changes in packaging and marketing that lead to lower levels of consumption and greater consumption awareness (Wansink & Chandon, 2014). Research has also suggested that one way to prevent overeating is to utilize "Epicurean nudging", which involves realizing that it is better to choose the most pleasurable food rather than the largest quantity available (Cornil & Chandon, 2015). Studies should focus on finding ways to enhance sensory experiences during dining to increase pleasure and mindfulness, which as a result may decrease consumption.

5 Conclusion

In line with the findings from Hydock, Wilson and Easwar (2016), the results of this study supported the Cognitive Distortion theory. Participants who received the larger serving size information modified their consumption by eating less of the product. The larger values (ex. calories, fat content) accompanying larger serving sizes likely sent the message that the product

was less healthy and contained more calories than when the smaller serving size was presented. Although the product was the same across each group and the nutrition value facts were accurate regardless of whether the serving size was for the normal serving size (2 cookies) or a larger serving size (4 cookies), the participant's consumption was significantly impacted by these differences. Therefore, modifying the serving size information on current packaging to represent a larger serving size may actually lead to decreased consumption. In other words, participants viewed the larger values as a sign that they should be consuming less because they likely perceived the product to be less healthy due to the larger values. In comparison, participants viewed the normal values as a sign that they can consume more because the product appears to be healthier. These results demonstrate how easily a person's perception of the healthiness of a product can be influenced.

The results of the study showed that participants were off by an average of 74 calories when estimating their actual consumption whether that be skewed positively or negatively. Therefore, despite the fact participants reported that they were more likely to base their purchasing decisions on health information than anything else (34%), they still had difficulty determining the amount of calories they had consumed. This demonstrates that in general, consumers struggle to estimate their caloric intake, which can lead to overconsumption. However, having a larger serving size presented on packaging can improve estimations either by drawing the participant's attention to the larger values or providing them with a more realistic representation of the nutritional value in a typical serving size.

The results of this study demonstrate that changing the serving size information displayed on packaging can significantly impact a person's health perceptions of a product and can in turn influence their consumption. Product health descriptions were also shown to influence the

perceived healthiness of a product, as participants presented a healthy product description were more likely to underestimate their actual consumption. This result supports the findings of previous studies demonstrating that consumers often base their purchasing decisions and consumption on health information presented on packaging and through marketing rather than from the actual nutritional value of the product. In conclusion, consumers are highly susceptible to subtle changes in labels on packaging and marketing tactics. Therefore, this is an area of research that should continue to be investigated, as it is important to determine optimal strategies to increase product health awareness ensuring that consumers can make informed choices regarding what they purchase and how much they consume.

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Appendices

Appendix A- Oatmeal Cookie Product Used

INGREDIENTS

Rolled oats, butter, brown sugar, wheat flour, fancy molasses, baking powder, baking soda, soya lecithin, vanilla extract.

Appendix B- Product Health Descriptions

Healthy- "This new product is made with the goodness of whole grain rolled oats. Baked with 10 or less simple and healthy ingredients and containing 2 grams of protein, you can consume this snack while feeling guilt-free. These oatmeal cookies are low in saturated fat, sodium and contain no artificial colours or flavours".

Unhealthy- "This new gourmet product is made with the goodness of real butter and old-fashioned brown sugar. Containing indulgent ingredients and a sweet taste, these delectable new cookies are absolutely addicting. You will be reminded of the taste of Grandma's baking as you treat yourself to these delicious guilty pleasures".

Appendix C- Product Serving Size Information

Normal Serving Size

Nutrition Facts

Serving Size Per 2 cookies (31g)

Amount Per Serving	
Calories 140	
	% Daily Values*
Total Fat 6g	**9%**
Saturated Fat 3.5g	**18%**
Trans Fat 0.1g	
Cholesterol 15mg	**5%**
Sodium 80mg	**3%**
Total Carbohydrate 22g	**7%**
Fiber 1g	**4%**
Sugars 8g	
Protein 2g	**4%**

Larger Serving Size

Nutrition Facts

Serving Size Per 4 cookies (62g)

Amount Per Serving	
Calories 280	
	% Daily Values*
Total Fat 12g	**18%**
Saturated Fat 7g	**35%**
Trans Fat 0.2g	
Cholesterol 30mg	**10%**
Sodium 160mg	**7%**
Total Carbohydrate 44g	**15%**
Dietary Fiber 2g	**8%**
Sugars 16g	
Protein 4g	**8%**

Appendix D- Questionnaires

1) Taste Test Questionnaire

1) How hungry are you right now?

Not Hungry— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Hungry

2) How sweet would you consider this product?

Not Sweet— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Sweet

3) How salty would you consider this product?

Not Salty— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Salty

4) How crunchy would you consider this product?

Not Crunchy— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Crunchy

5) How bitter would you consider this product?

Not Bitter— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Bitter

6) How sour would you consider this product?

Not Sour— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Sour

7) How would you rate the colour/appearance of this product?

Not Appealing— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Appealing

8) How would you rate the taste/flavour of this product?

Not Appealing— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Appealing

9) How would you rate the odor/aroma of this product?

Not Appealing— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Appealing

10) How would you rate the texture of this product?

Not Appealing— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Appealing

11) How likely would it be that you would normally purchase an oatmeal cookie product when shopping?

Not Likely— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Likely

12) How likely would it be that you would purchase this oatmeal cookie product?

Not Likely— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Likely

13) How likely would it be that you would recommend this product to others?

Not Likely— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Likely

2) Demographics Questionnaire

Age: _____ years.

Gender: _____.

Height: _____ feet _____ inches.

Weight: _____ pounds.

1) Prior to this experiment, what is the last food you ate?

_____

2) At approximately what time did you consume the food you listed above?

_____

3) Would you consider yourself a "healthy" eater? (Circle One)

YES NO

4) Do you normally pay attention to the nutrition facts on the products you consume?

YES NO

5) Have you tried to change your weight in the past year through changes in your diet?

YES NO

6) Are you currently trying to change your weight through changes in your diet?

YES NO

7) Are you currently satisfied with your weight?

YES NO

8) Do you consume oatmeal cookies in your regular diet?

YES NO

9) If so, what brand of oatmeal cookies do you normally consume?

_____

10) When grocery shopping, what are you most likely to base your purchasing decisions on? (Circle One)

Taste Price Health Information Packaging

Other_____

3) Estimations and Ratings Questionnaire

1) How many grams of this product do you think you just consumed?

_____ grams.

2) How many calories of this product do you think you just consumed?

_____ calories.

3) How much would you be willing to pay for this product (box containing 20 cookies)

_____ dollars.

4) How healthy do you feel after consuming this product?

Not Healthy— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Healthy

5) How guilty do you feel after consuming this product?

Not Guilty— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Guilty

6) How guilty would you feel if you were consuming this product on a regular basis?

Not Guilty— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Guilty

7) How healthy would you feel if you were consuming this product on a regular basis?

Not Healthy— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Healthy

8) What is the likelihood that you would gain weight if you consumed this product on a regular basis?

Not Likely— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Likely

9) What is the likelihood that you would purchase this product in the future?

Not Likely— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Likely

10) How ideal is this product for your own personal taste?

Not Ideal— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Ideal

11) How anxious are you on a regular basis?

Not Anxious— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Anxious

12) How anxious were you during this experiment?

Not Anxious— 1 — 2 — 3 — 4 — 5 — 6 — 7 — 8 — 9 —Very Anxious

13) Do you think your hunger level played a role in the amount you consumed during this experiment?

YES NO

Appendix E- Ranging Healthiness of Oatmeal Cookies Sample

Subway Oatmeal Cookies

Nutrition Facts	
Serving Size 1 cookie (45g)	
Amount Per Serving	
Calories 200	
	% Daily Values*
Total Fat 8g	**12%**
Saturated Fat 4g	**20%**
Trans Fat 0g	
Cholesterol 15mg	**5%**
Sodium 130mg	**5%**
Total Carbohydrate 30g	**10%**
Fiber 1g	**4%**
Sugars 16g	
Protein 3g	**6%**

Voortman Sugar Free Oatmeal Cookies

Nutrition Facts	
Serving Size 1 cookie (20g)	
Amount Per Serving	
Calories 90	
	% Daily Values*
Total Fat 5g	**8%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Sodium 50mg	**2%**
Total Carbohydrate 13g	**4%**
Fiber 1g	**4%**
Sugars 0g	
Protein 1g	**2%**

Dad's Oatmeal Cookies

Nutrition Facts	
Serving Size 2 cookies (24g)	
Amount Per Serving	
Calories 120	
	% Daily Values*
Total Fat 5g	**8%**
Saturated Fat 1g	**5%**
Trans Fat 0g	
Sodium 100mg	**4%**
Total Carbohydrate 16g	**5%**
Fiber 1g	**4%**
Sugars 7g	
Protein 1g	**2%**

Farmer's Market Oatmeal Cookies

Nutrition Facts	
Serving Size 1 cookie (33g)	
Amount Per Serving	
Calories 150	
	% Daily Values*
Total Fat 6g	**9%**
Saturated Fat 2.5g	**13%**
Trans Fat 0.1g	
Sodium 115mg	**5%**
Total Carbohydrate 23g	**8%**
Fiber 1g	**4%**
Sugars 10g	
Protein 2g	**4%**

Appendix F- Recruitment Script

Principal Investigators:

Breeanna Streich
Masters Student
Department of Psychology
Laurentian University
bstreich@laurentian.ca

Michael Emond, Ph.D.
Department of Psychology
Laurentian University
memond@laurentian.ca
(705)-675-1151 ext. 4246

My name is Breeanna Streich, and I am a graduate student in Applied Psychology at Laurentian University. My thesis supervisor is Dr. Emond and my research is on consumer preferences and buying habits. I have been asked by a food company to conduct a taste test for a new oatmeal cookie product. As part of my study, I will be analyzing how age can impact perception of taste in females. The product used in this study is produced in a nut free environment; however, it does contain wheat, oats, soya and milk. Therefore, those with allergies to the ingredients listed should avoid signing up to participate in this study.

Participants will be asked to refrain from consuming any food at least 2 hours before arriving to the experiment. During the taste test the researcher will be available to answer questions about the product's ingredients and nutritional information. The entire session will take approximately one hour. Participants will be provided with a short description of the product and given a questionnaire to complete as they consume the cookies. The questionnaire will ask their opinions of the cookie. Participants will then be asked to fill out demographic information. (ex. age, height, and weight). This will help the researcher and company develop an understanding of their consumers and more importantly their buying habits, which helps when developing marketing strategies.

This study has been reviewed and received ethics approval through the Ethics Board of the Department of Psychology. Anonymity and confidentiality of all information collected is assured. Your participation in this study is strictly voluntary and you will be able to withdraw at any time without penalty. If you are a Laurentian University student and you choose to participate, you may receive a bonus mark toward your final grade with the permission of your professor.

If you are a **female over the age of 18** who is interested in participating please email the researcher at bstreich@laurentian.ca for more information and to book a session.

Thank you.

Appendix G- Informed Consent

Breeanna Streich
Laurentian University
bstreich@laurentian.ca

I, _____, am interested in participating in this oatmeal cookie taste test. This study is being conducted by Breeanna Streich, a graduate student supervised by Dr. Emond. This study helps to develop a better understanding of how marketing and labels can influence what people buy and how much they consume.

My participation will consist of attending a session lasting approximately one hour during which I will be provided with a description of the product and shown asked to complete various questionnaires while consuming as many oatmeal cookies as I wish. The results of this study will be kept confidential, and only the researcher and her supervisor will have access to them. No personal information will be disclosed. However, digital data will be kept indefinitely (with no ID or reference numbers connecting participants to their data) and may be used for publications in the future.

My participation is strictly voluntary and I am free to withdraw from the study at any moment or refuse to participate without any penalty. If I am uncomfortable with any particular question, I am able to refuse to answer.

If you have any ethical concerns about this study, you may contact: Dr. Rousseau (Chair of ethics committee) with the Laurentian University Psychology Department Ethics committee. You may contact Dr. Rousseau at lrousseau@laurentian.ca or (705) 675-1151 ext. 4253.

If you have any concerns about the ethical conduct of this study, you can contact the LU Research Officer, Pauline Zanetti at ext. 2436 or ethics@laurentian.ca or you can call toll free at 1-800-461-4030.

If you should have any questions regarding this study please feel free to ask or to contact the research supervisor Dr. Emond at memond@laurentian.ca or (705)-675-1151 ext. 4246

Participant's Signature:_____ Date: _____

Researcher's Signature:_____ Date: _____

I wish to receive a summary of the results of this study that will be available in April 2018, at the following address: _____

Appendix H- Debriefing Form

Thank you for participating in this research study conducted by Breeanna Streich under the supervision of Dr. Michael Emond. The goal of this study was to explore whether health descriptions, as well as suggested serving size can influence the amount of calories a person consumes. Research has shown that when food products are marketed as "healthy" people are more likely to consume a higher amount of calories, as well as additional sugary drinks and side dishes that are high in calories (Wansink & Chandon, 2007). Studies have also found that people feel less guilty after consuming products with "healthy" descriptions as they are perceived as less likely to promote weight gain. Participants in this study were presented the same oatmeal cookie product with varying descriptions (healthy or unhealthy), as well as serving size (normal serving size or larger serving size). The researcher will be exploring how manipulating these factors will influence the estimation of calorie consumption, actual calorie consumption, as well as product evaluations.

This study helps to develop a better understanding of how marketing and labels can influence what people buy and how much they consume. The results of this study can impact the future of food labelling, as it demonstrates how wrongful messages of healthiness can contribute to rates of obesity. These results will also show whether increasing serving size will have an impact on consumption, as well as perceived healthiness of a product.

As a recap, all personal information obtained through the informed consent form will be kept separate from the experimental data, ensuring anonymity and confidentiality. We would ask you to please refrain from discussing any of the information surrounding this research study with others. These individuals could potentially participate in this study and any information that they have prior to it may affect the results that we collect from them.

If you would like to discuss certain aspects of this research study or have any concerns, you may contact the student researcher, Breeanna Streich at bstreich@laurentian.ca or her supervisor, Dr. Michael Emond at memond@laurentian.ca. Additionally, if you are interested in reading about the background of this experiment, you may consult the following sources:

Provencher, V., Polivy, J., & Herman, C. P. (2009). Perceived healthiness of food. if it's healthy, you can eat more! Appetite, 52(2), 340-344. Retrieved from: http://dx.doi.org.librweb.laurentian.ca/10.1016/j.appet.2008.11.005

Wansink, B., Chandon, P. (2007). The biasing health halos of fast-food restaurant health claims: Lower calorie estimates and higher side-dish consumption intentions. Journal of Consumer Research, 34(3), 301-314. Retrieved from: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2474843